

DEPARTMENT OF TRANSPORTATION

DIVISION OF ENGINEERING SERVICES

OFFICE ENGINEER

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September 27, 2011

08-SBd-15-R111.6,R120.4,R124.2

08-0G4804

Project ID 0800000209

IM-015-2(036)215E

Addendum No. 3

Dear Contractor:

This addendum is being issued to the contract for CONSTRUCTION ON STATE HIGHWAY IN SAN BERNARDINO COUNTY 18 MILES SOUTH OF BAKER AT AFTON ROAD OVERCROSSING, AT BASIN ROAD OVERCROSSING AND AT RASOR ROAD OVERCROSSING.

Submit bids for this work with the understanding and full consideration of this addendum. The revisions declared in this addendum are an essential part of the contract.

Bids for this work will be opened on Thursday, October 13, 2011. The original bid opening date was previously postponed indefinitely under Addendum No. 2 dated August 25, 2011.

This addendum is being issued to set a new bid opening date as shown herein and revise the Project Plans, the Notice to Bidders and Special Provisions. And to revise the Federal Minimum Wages with Modification Number 32 dated September 16, 2011.

Project Plan Sheets 28A, 40A, and 52A are added. Copies of the added sheets are attached for addition to the project plans.

In the Special Provisions, Section 10-1.28, "COMPOSITE COLUMN CASING," is revised as attached.

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To Bid book holders:

Inquiries or questions in regard to this addendum must be communicated as a bidder inquiry and must be made as noted in the Notice to Bidders section of the Notice to Bidders and Special Provisions.

Indicate receipt of this addendum by filling in the number of this addendum in the space provided on the signature page of the Bid book.

Submit bids in the Bid book you now possess. Holders who have already mailed their book will be contacted to arrange for the return of their book.

Inform subcontractors and suppliers as necessary.

This addendum, attachments and the modified wage rates are available for the Contractors' download on the Web site:

http://www.dot.ca.gov/hq/esc/oe/project_ads_addenda/08/08-0G4804

If you are not a Bid book holder, but request a book to bid on this project, you must comply with the requirements of this letter before submitting your bid.

Sincerely,



for REBECCA D. HARNAGEL
Chief, Office of Plans, Specifications & Estimates
Office Engineer
Division of Engineering Services

Attachments

10-1.28 COMPOSITE COLUMN CASING

GENERAL

Summary

This work shall consist of furnishing and constructing composite column casings as shown on the plans in accordance with the provisions specified in the Standard Specifications and these special provisions.

The allowable types of casing to be used for construction of composite column casing are shown on the plans for each bridge. The type of casing to be constructed shall be selected by the Contractor from the allowable types of casings shown on the plans. Only one type shall be used in any one bridge. The Contractor shall submit his bid based on constructing one of the alternatives listed and as shown on the plans. The Contractor will be required to construct the alternative upon which his bid was submitted and the award of the contract was made.

The spaces to be occupied by the column casing materials shall be cleared of plants and other materials prior to encasing the column.

Removed plants and other materials shall be disposed of outside the highway right of way in accordance with the provisions in Section 7-1.13, "Disposal of Material Outside the Highway Right of Way," of the Standard Specifications.

Drain extension pipe shall conform to the provisions for drainage piping in Section 75-1.03, "Miscellaneous Bridge Metal," of the Standard Specifications.

The same information that is on existing columns shall be painted on casings in conformance with the provisions in Section 51-1.21, "Bridge Name, Number, and Bent Numbers," of the Standard Specifications.

Composite column casing consists of the following approved systems:

SYSTEM	PRODUCT	MANUFACTURER	TYPE OF COMPOSITE CASING
1	TYFO SEH-51, SEH-51A Hex-3RWrap-107/Hex-3R Epoxy-300	Fyfe Co. Hexcel Corp.	Epoxy / E-glass fiber
2	XxSYS AS4D/M10E	XXsys	Epoxy resin prepreg carbon fiber
3	DuPont E-Glass/Vinylester	Hardcore DuPont	Prefabricated vinylester E-glass
4	SNAP TITE	CMI	Prefabricated polyester E-glass
5	MBrase CF130	BASF Corp.	Epoxy / Carbon fiber
6	Replark 30/L700S-LS	Mitsubishi Chemical	Epoxy / Carbon fiber
7	UT70-30/L700S-LS	Toray	Epoxy / Carbon fiber
8	VelaCarb 355u/Veloxx LR	Edge Structural Composites	Epoxy / Carbon fiber
9	TYFO SCH-41	Fyfe Co.	Epoxy / Carbon fiber

The acceptable column casing systems listed above for this project have been selected from the Department's current list of prequalified column casings, and are limited to only those systems which have been determined to have characteristics suitable for this project. Only prequalified column casing systems, casing system suppliers or installers, materials or construction processes will be allowed, unless otherwise directed by the Engineer.

The list of prequalified systems and the prequalification requirements can be obtained from the Office of Earthquake Engineering, P.O. Box 942874, MS 9, Sacramento, CA 94274-0001, or can be found at the following internet site: http://www.dot.ca.gov/hq/esc/approved_products_list/

Submittals

The contractor shall submit working drawings to the Office of Structure Design, Documents Unit, P.O. Box 942874, MS 9, Sacramento, California 94274-0001 (1801 30th Street, Sacramento, CA 95816), telephone (916) 227-8230, for approval in accordance with the provisions in Section 5-1.02, "Plans and Working Drawings." For initial review, 6 sets of such drawings shall be submitted for highway bridges. After review, between 6 and 12 sets, as requested by the Engineer, shall be submitted to said office for final approval and for use during construction.

The Contractor shall allow 3 weeks for the review by the Engineer for highway bridges, after complete drawings and all supplemental data for the composite column casing is submitted.

The working drawings for composite column casing shall contain details of the dry sheet, fabric thickness; the number of wraps or layers to construct the minimum effective dry fiber composite thickness shown on the plans; % fiber volume fraction; the direction and orientation of the primary fiber, details of joints and ends of fiber construction; details of the transition in composite thickness; plan for curing, if required; methods for coring and for fabrication of test samples. Information provided shall include material properties of the fiber reinforced polymer (FRP) composite system.

The working drawings for composite column casings shall contain the name of the independent testing facility located within 300 air line miles from both Sacramento and Los Angeles to be used to test samples and cores; 3 copies of the Process Specification Manual furnished with prequalification; and all information required for the proper construction of the system at each location including any required revisions or additions to drainage systems or other facilities.

Working drawings for composite column casing shall also include the precautions that are necessary to protect the workmen and the public from hazardous materials that may be present or generated during composite column casing construction.

The working drawings for composite column casing shall include the material supplier's name, material technical data sheets, material safety data sheets, and commercial material designation for all the materials to be used in the composite column casing. The following properties for the resin (neat) shall be included with the working drawings: mix ratio by weight and volume, pot life, shelf life, resin gel time at proposed cure temperatures, mixing and application temperature ranges. The materials shall be certified by the responsible manufacturers or suppliers to be the same as those used in the prequalified column casings and a Certificate of Compliance shall be furnished to the Engineer in accordance with the provisions in Section 6-1.07, "Certificate of Compliance," of the Standard Specifications.

A Certificate of Compliance for the FRP composite system shall be furnished to the Engineer in conformance with the provisions in Section 6-1.07, "Certificate of Compliance," of the Standard Specifications.

At the completion of each structure on the contract, one set of reduced prints on 60 pound (minimum) bond paper, 11 inches by 17 inches in size, of the corrected original tracings of all working drawings for each structure shall be furnished to the Engineer. Reduced prints that are common to more than one structure shall be submitted for each structure. An index prepared specifically for the drawings for each structure containing sheet numbers and titles shall be included on the first reduced print in the set for each structure. Reduced prints for each structure shall be arranged in the order of drawing numbers shown in the index.

The edge of the corrected original tracing image shall be clearly visible and visually parallel with the edges of the page. A clear, legible symbol shall be provided on the upper left side of each page to show the amount of reduction and a horizontal and vertical scale shall be provided on each reduced print to facilitate enlargement to original scale.

MATERIALS

Composite casing shall be constructed by wrapping the column with layers of continuous fiber embedded in resin. The composite column casing for wet lay-up Systems 5, 8, and 9 shall conform to the following requirements:

PROPERTIES at 72±2°F	Wet Lay-Up Carbon				ASTM TEST METHOD ⁺⁺
	Dry Fiber	Composite			
Ultimate Tensile Strength, in primary fiber direction*, ksi, minimum	500	130.5			D 3039
Ultimate Elongation, %, minimum	1.35	0.9			
Composite Tensile modulus of primary fiber, ksi, minimum.	28.8	9.4			
Fiber volume, percent, %, minimum.	25				D 2584 or D 3171
Glass transition temperature, minimum.	140				D 3418 or D 4065
Interlaminar Shear, ksi, minimum.	6.24				D 2344
Dry Fiber Thickness** Per layer, in.	.0065				

* Horizontal fibers circumscribing the column.

** System 9 is the effective composite thickness, 0.04" and 0.041", respectively. System 8 dry fiber thickness is 0.00689"

⁺⁺ Subject to approval of the Engineer, other test methods, such as those published by Suppliers of Advanced Composite Materials Association (SACMA), or manufacturer's published Quality Control Procedures may be used when equivalency and suitability have been documented.

Fiber sheet for Systems 5, 8, and 9 shall be composed of unidirectional PAN based continuous sheet carbon fiber.

Epoxy resins for all systems shall conform to the requirements in Section 95-1, "Epoxy," of the Standard Specifications and these special provisions, except that (1) no State Specification Number will be required and (2) the epoxies shall be the same as that used in prequalification testing.

CONSTRUCTION

The storage and handling of materials and the construction of the composite casing shall be in accordance with the requirements of the approved Process Specification Manual, except as modified in these special provisions. Materials shall be protected from dirt, moisture, chemicals, extreme temperatures, and physical damage.

Where shown on the plans, corners of columns shall be rounded and smoothed to a minimum of 1 1/2 inch radius and a Class 1 surface finish in accordance with Section 51, "Concrete Structures," of the Standard Specifications prior to the application of fibers. Filler material, if required, shall be system compatible epoxy.

The surface to receive the FRP composite system shall be prepared by abrasive blasting or grinding. Surfaces to receive composite shall be free from fins, sharp edges and protrusions that will cause voids or depressions behind the installed casing or that, in the opinion of the Engineer, will damage the fibers. Voids or depressions are defined as volumes greater than 1/2 inch in diameter by 1/8-inch deep. Existing uneven surfaces to receive composite, including voids or depressions, shall be filled with epoxy or epoxy-based filler. Flat sides of columns shall be filled straight from corner to corner or made slightly convex.

The contact surfaces of the columns, or surfaces at any stage of installation, shall be completely dry and free of dust, dirt, oil, at the time of application of the composite. The ambient temperature and temperature of epoxy resin components shall be between 45°F and 95°F at time of mixing and application. The composite shall be applied when the relative humidity is less than 90 percent at the site and the surface temperature is more than 5°F above the dew point.

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If, in the opinion of the Engineer, the composite is damaged by the elements it shall be replaced or repaired by the Contractor at the Contractor's expense.

Subject to approval by the Engineer in writing, the Contractor may provide suitable enclosures to permit application and curing of the composites during inclement weather. Provisions shall be made to control atmospheric conditions artificially inside the enclosures within limits specified for application and curing of the composite.

Prior to application of the composites, the area of the column to be encased using Systems 5, 8, and 9 shall be completely coated with a 5 mil, minimum, thick primer coat of system-compatible epoxy resin, and shall be allowed to cure for a minimum of one hour.

Following the application and curing of all systems, the exterior surfaces shall be completely coated with a 15 mil, minimum, thick coat of resin that produces a uniform finished surface. The resin used for this cover shall be a system-compatible resin formulated to resist crazing and chipping. All seams, joints, and edges shall uniformly and completely filled with a system-compatible thickened resin.

Components which have exceeded their shelf life shall not be used.

Composite column casing systems shall not support combustion.

During construction of composite column casings, the Contractor shall maintain a Daily Installation Data Log. The Daily Installation Data Log shall be available for review by the Engineer, and a copy furnished to the Engineer at completion of installation and construction for each day's production. The data log shall provide materials traceability and process records for each casing installation, and shall include all of the following information:

1. Casing identification with bridge number, construction and installation requirements, including plans and drawings, or references thereto.
2. Materials information including product description, date of manufacture, and lot or batch numbers.
3. Fabrication, inspection and verification data for the manufacturing and construction operations including a list of materials and quantities used during shift, wrap counts, number of shells, composite thickness measurements, installation time per casing, towpreg band pitch measurements, ambient temperature and humidity readings at beginning, middle and end of each casing installation shift, curing processes including full documentation of time and temperature relationship for curing and at final curing temperature and thickness measurements of any protective coating applied to the completed composite casing following installation.

Systems 5, 8, and 9: Application

The components of epoxy resin shall be proportioned and thoroughly mixed by automatic equipment to within 5 percent of the specified mix ratio. Provisions shall be made for checking the accuracy of proportions and mixing.

The resin shall be applied within one hour after a batch has been mixed.

Both epoxy resin and fiber sheet shall be measured, and applied uniformly at the rates shown on the approved working drawings.

The carbon fiber sheet, which is comprised of unidirectionally aligned fibers, shall be applied to the surface of the column by wrapping, using methods that produce a uniform tensile force that is distributed across the entire width of fiber sheet.

Successive layers of composite materials shall be placed before complete cure of the previous layer of epoxy to achieve complete bond between layers. After 7 days, or complete cure, a light surface sand blasting, cleaning with fresh water and drying is required prior to placing additional layers.

The fibers of the fiber sheet shall not deviate from a horizontal line more than a 0.5-inch per foot.

The epoxy application rate for each layer of composite shall ensure complete saturation of the fiber sheet.

Undulations in the surfaces of composite column casings shall not exceed 1/4 inch per foot in any direction. The cured composite shall have a uniform thickness, density, bond between layers and lack of porosity.

Except as otherwise specified, entrapped air beneath each layer shall be rolled or squeegeed out before the epoxy sets, and each individual layer and ending of composite shall be firmly bedded and adhered to the preceding layer.

An overlap length of 6 inches is required for splices in the fiber direction of individual layers. No horizontal overlap is required when placing parallel sheets.

The cured composite shall have uniform thickness and density and bond between layers.

This system shall be protected from any moisture including exposure to rainfall or submersion for a period of at least 48 hours.

Job Control Tests, Inspection and Repair

During progress of the work, in addition to inspection performed by the Engineer, job control tests shall be made on samples and cores of composite casing, which shall be furnished to the Engineer at the Contractor's expense. Samples and cores for job control tests of composite casing shall be fabricated or cored by the Contractor and tested at the Contractor's expense in the presence of the Engineer, unless otherwise directed. The job control testing shall be done at an independent testing facility approved by the Engineer. A copy of the job control test results shall be furnished to the Engineer within 30 days following sample fabrication and within sufficient time to allow for review by the Engineer and correction by the Contractor of any deficiencies without delaying completion of the work.

The composite samples for job control tests shall be used to verify compliance with the requirements shown in the property tables. The composite samples shall consist of 2-ply laminates for Systems 5 through 9. The test specimens shall be provided throughout the duration of the job at intervals determined by the Engineer. The lap test specimens shall have a minimum of 800 psi in lap shear. Each sample of composite shall be at least 4 square feet in total area for each type of composite to be used, and may consist of one piece or individual pieces not less than 12 inches by 12 inches in area. One sample of each day's production of column casing shall be tested, unless otherwise directed by the Engineer. Each composite sample shall be manufactured and cured in the same manner as composite used in the field installation.

The composite casings shall have at least the number of wraps and thickness as shown on the plans, and shall conform to the requirements for fiber volume and glass transition temperature for composite column casings. These dimensions and properties shall be verified, after application and cure, by taking 0.5-inch diameter cores from the composite for job control testing. One job control core shall be taken by the Contractor on each column, as shown on the plans, unless otherwise directed by the Engineer, at locations determined by the Engineer. One check test core shall be taken by the Contractor and furnished to the Engineer for testing for each column at a location determined by the Engineer. Care shall be taken during coring operations to ensure that undamaged cores are obtained, and that minimal damage occurs to the adjacent composite and column. All cores shall be placed in labeled and sealed polyethylene bags prior to shipment to the testing facility or furnishing to the Engineer. Core holes shall be filled with a system-compatible resin and smoothed flush prior to painting the composite casing.

Should the results of tests on the samples or cores in any job control test fail to comply with these specifications, the composite casing represented by that test will be rejected in accordance with the provisions in Section 6-1.04, "Defective Materials," of the Standard Specifications.

Composite column casings shall be constructed in a manner consistent with the best commercial practices. The cured composite material encasing columns will be inspected for defects consisting of external abrasions or blemishes, delaminations, voids, external cracks, chips, cuts, loose fibers, foreign inclusions, depressible raised areas, or fabric wrinkles. The following criteria shall apply:

1. Each layer shall have full contact with the column or subsequent layers subject to the following tolerances. All defects or voids with a dimension greater than 1 1/2 inches, defect areas greater than one square inch, or defect areas with any dimension greater than 1 inch within one foot from another defect area of similar size, shall be repaired or replaced as determined by the Engineer.
2. Surfaces of horizontal joints shall be flush with adjacent surfaces.
3. Undulations and sags which do not meet previously specified tolerances will be rejected by the Engineer.
4. Within either the full casing height or any 10 feet of casing height, whichever is smaller, composite casings with a total number of 10 or more defects of any size shall be repaired or replaced as determined by the Engineer.
5. All repairs shall be completed, cured and approved by the Engineer prior to preparing surfaces for painting.

Preparing Surfaces and Painting Composite Casing

Exposed surfaces of composite casings, including surfaces below ground, shall be cleaned and painted in accordance with the provisions in Sections 59-1, "General," and 91, "Paint," of the Standard Specifications and these special provisions.

The surfaces to be cleaned and painted shall be lightly roughened by uniform abrasive blasting using an abrasive no larger than 80 mesh. The air pressure at the nozzle used for abrasive blasting shall not exceed 80 psi. The abrasive shall be of appropriate hardness to roughen the surface without damage to the fiber portion of the composite. The fiber portion of the composite shall not be exposed by the abrasive blasting operation. Abrasive blasting will not be required for Systems 5, 8, and 9 if the first coat of paint is applied within 48 hours after mixing the components for the final 15 mil resin coating; however, the final 15 mil resin coating must cure for a minimum of 24 hours prior to painting.

Dust and residue shall be removed from all surfaces by flushing with clean water after a minimum of 48 hours before painting.

All surfaces of the composite casing shall be completely dry before receiving a minimum of 2 finish coats of an exterior grade paint that is formulated to be system-compatible with the composite in accordance with ASTM D-3359, Method A, with a minimum rating of 4A.

The first finish coat shall be applied in a minimum of 2 applications. The total dry film thickness of all applications of the first finish coat shall be not less than 2 mils.

Successive applications of paint shall be of such a shade as to contrast with the paint being covered.

Except as approved by the Engineer, a minimum drying time of 12 hours shall be allowed between finish coats.

The second finish coat color shall match Federal Standard 595B No. 26408. The total dry film thickness of all applications of the second finish coat shall be not less than 2 mils.

The 2 finish coats shall be applied in 3 or more applications to a total dry film thickness of not less than 4 mils or more than 8 mils.

MEASUREMENT AND PAYMENT

Composite column casing will be measured by the square foot. The quantity to be paid for will be the area of the existing concrete column surface to be encased by the column casing shown on the plans and no change in the quantities to be paid for will be made because of the use by the Contractor of a different type of column casing.

The contract price paid per square foot for composite column casing shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in furnishing and constructing composite column casings complete in place, including removing and disposing of plants and other materials, removal of fins, sharp edges and protrusions and filling of voids in casings or depressions in surfaces to receive composite, rounding of corners, extending drainage piping, job control testing, and cleaning and painting column casings as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

If a portion of or all samples are removed at a location more than 299 air line miles from both Sacramento and Los Angeles, shop inspection expenses will be sustained by the State which are in addition to expenses incurred for fabrication site inspection. Payment to the Contractor for alternative column casing will be reduced \$2,000 for each location more than 299 air line miles from both Sacramento and Los Angeles.

Full compensation for any additional testing, materials, enclosures, or work required because of the use of a particular type of column casing shall be considered as included in the contract price paid per square foot for composite column casing, and no additional compensation will be allowed therefor.